APPENDIX 10.1

Civil Engineering Design Criteria

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10.1.1 Introduction

This appendix summarizes the codes, standards, criteria, and practices that will be generally used in the design and construction of civil engineering systems for the facility. More specific project information will be developed during execution of the project as necessary to support detailed design, engineering, material procurement specifications and construction specifications.

10.1.2 Codes and Standards

The design of civil engineering systems for the project will be in accordance with the laws and regulations of the federal government, the State of California, City of Chula Vista ordinances, and industry standards. The current issue or edition of the documents at the time of this filing will apply, unless otherwise noted. In cases where conflicts between the cited documents exist, requirements of the more current document will be used.

10.1.2.1 Civil Engineering Codes and Standards

The following codes and standards have been identified as applicable, in whole or in part, to civil engineering design and construction of power plants.

- American Association of State Highway and Transportation Officials (AASHTO)—Standards and Specifications
- American Concrete Institute (ACI) – Codes, Standards and Recommended Practices
- American Institute of Steel Construction (AISC) - Standards and Specifications
- American National Standards Institute (ANSI) - Standards
- American Society of Testing and Materials (ASTM) - Standards, Specifications, and Recommended Practices
- American Water Works Association (AWWA) - Standards and Specifications
- American Welding Society (AWS) - Codes and Standards
- Asphalt Institute (AI) - Asphalt Handbook
- California Code of Regulations – Title 24, California Building Code
- California Energy Commission - Recommended Seismic Design Criteria for Non-Nuclear Generating Facilities in California, 1989
- Code of Federal Regulations, Title 29—Labor, Chapter XVII, Occupational Safety and Health Administration (OSHA).

  - Part 1910—Occupational Safety and Health Standards.
  - Part 1926—Construction Safety and Health Regulations

- Concrete Reinforcing Steel Institute (CRSI) - Standards
- Factory Mutual (FM) - Standards
- National Fire Protection Association (NFPA) - Standards
- International Conference of Building Officials (ICBO) - Uniform Building Code (UBC), 1997
- Steel Structures Painting Council (SSPC) - Standards and Specifications
- California Referenced Standards Code, 2001 edition as amended by the City of Chula Vista.

10.1.2.2 Engineering Geology Codes, Standards, and Certifications

Engineering geology activities will conform to applicable federal, state and local laws, regulations, ordinances and industry codes and standards.

10.1.2.2.1 Federal

None are applicable.

10.1.2.2.2 State

The Warren-Alquist Act, PRC, Section 25000 et seq. and the California Energy Commission (CEC) Code of Regulations (CCR), Siting Regulations, Title 20 CCR, Chapter 2, require that an AFC address geologic and seismic aspects of the site.

The California Environmental Quality Act (CEQA), PRC 21000 et seq. and the CEQA Guidelines require that potential significant effects, including geologic hazards, be identified and a determination made as to whether they can be substantially reduced.

10.1.2.2.3 City

California State Planning Law, Government Code Section 65302, requires each city to adopt a general plan, consisting of nine mandatory elements, to guide its physical development. Section 65302(g) requires that a seismic safety element be included in the general plan.

Site development activities will require certification by a Professional Geotechnical Engineer and a Professional Engineering Geologist during and following construction, in accordance with the Uniform Building Code (UBC), Chapter 70. The Professional Geotechnical Engineer and the Professional Engineering Geologist will certify the placement of earthen fills and the adequacy of the site for structural improvements, as follows:

- Both the Professional Geotechnical Engineer and the Professional Engineering Geologist will address UBC Chapter 70, Sections 7006 (Grading Plans), 7009 (Cuts), 7012 (Terraces), 7013 (Erosion Control), and 7015 (Final Report).
- The Professional Geotechnical Engineer will also address UBC Chapter 70, Sections 7011 (Cuts) and 7012 (Terraces).

Additionally, the Professional Engineering Geologist will present findings and conclusions pursuant to PRC, Section 25523 (a) and (c); and 20 CCR, Section 1752 (b) and (c).

City of Chula Vista Laws, Ordinances, and Regulations provide further direction and are considered to supplement requirements as set forth above.

10.1.3 Criteria and Practices

The design of civil engineering systems for the project will be in accordance with certain commonly accepted design criteria and standard practices. Several of these are outlined below for reference.

10.1.3.1 Design Loads

Design loads for structures and equipment foundations are discussed in Appendix B. Design loads for pavement and buried items will be determined according to the criteria described below, unless the applicable building code requires more conservative design conditions.

10.1.3.1.1 Wheel Loads

Loads exerted on roadway pavement, buried piping, electrical duct banks, and culverts will be reviewed and selected prior to design of the underlying items. At a minimum, these items will be designed for HS20-44 loadings in accordance with AASHTO Standard Specifications. Loadings exceeding the HS20-44 loadings will be considered where found applicable during the detailed design phase.

A surcharge load of 250 pounds per square foot (psf) will be applied to plant structures accessible to truck traffic.

10.1.3.2 Site Considerations

Site arrangement and preparation considerations include the following.

10.1.3.2.1 Site Arrangement

The site arrangement will conform to all applicable laws, regulations, and environmental standards. The principal elements to be considered in establishing the site arrangement include the physical space requirements and relationships dictated by each of the major plant systems and the constraints imposed by the physical size and existing topography of the site. Distances from the main plant to various systems will be minimized for economy. However, adequate clearance between various plant systems will be provided as needed for construction, operations, maintenance, and fire protection. The plant will be configured to minimize construction costs and visual impacts while remaining operationally effective. Routings for utility interconnections will be optimized as much as practical.

10.1.3.2.2 Site Preparation

Site preparation will consist of clearing and grubbing, excavation of soils to design grade, and the preparation of fill slopes and embankments designed so as to be stable and capable of carrying the anticipated loads from either equipment or structures.

Root mats or stumps, if any, will be removed to a depth of not less than two feet below existing grade, and holes will be refilled with compacted material suitable for embankment construction. Materials from clearing and grubbing operations will either be removed from the site or, if suitable, reused onsite.

10.1.3.2.3 Earthwork

Earthwork will consist of the removal, storage, and/or disposal of earth, sand, gravel, vegetation, organic matter, loose rock, boulders, and debris to the lines and grades necessary for construction. Material suitable for backfill will be stored in stockpiles at designated locations using proper erosion protection and control methods. Excess and unsuitable material will be removed from the site and disposed of at an acceptable location. If contaminated material is encountered during excavation, it will be disposed of in compliance with applicable federal, state, and local regulations.

Material will be brought onsite to raise the site grade to provide for proper stormwater drainage to offsite drainage ways.

Graded areas will be finished to be smooth, compacted, free from irregular surface changes, and sloped to drain. Cut and fill slopes for permanent embankments will be designed to withstand horizontal ground accelerations for Seismic Zone 4. For slopes requiring soil reinforcement to resist seismic loading, geogrid reinforcement will be used in fill areas and soil nails will be used in cut areas.

Slopes for embankments will be no steeper than 3:1 (horizontal:vertical).

Areas to be backfilled will be prepared by removing unsuitable material and rocks. The bottom of excavations will be examined for loose or soft areas and all areas will be excavated fully and backfilled with compacted fill.

Backfilling will be in layers of uniform, specified thickness. Soil in each layer will be properly moistened to facilitate compaction and achieve the specified density. To verify compaction, representative field density and moisture-content tests will be taken during compaction. Structural fill supporting foundations, roads, parking areas, etc., will be compacted to at least 95 percent of the maximum dry density as determined by ASTM D698. Embankments, dikes, bedding for buried piping, and backfill surrounding structures will be compacted to at least 90 percent of the maximum dry density. General backfill placed in remote and/or unsurfaced areas will be compacted to at least 85 percent of the maximum dry density.

Where fills are to be placed on subgrades sloped at 6:1 (horizontal: vertical) or steeper, keys or “benches” into the existing subgrade may be provided to help withstand horizontal seismic ground accelerations.

The subgrade (original ground), subbases, and base courses of roads will be prepared and compacted in accordance with California Department of Transportation (Caltrans) standards. Testing will be in accordance with ASTM and Caltrans standards.

10.1.3.2.4 Site Drainage

The site drainage system will be designed to comply with all applicable federal, state, and local regulations.

Runoff from possible oil contamination areas, such as the lube oil storage area and transformer areas, will be contained within a foundation containment by use of a valve. If stormwater accumulates in the containment is found to be free of oil after inspection, the valve will be opened and water will be allowed to drain and flow to the stormwater sewer system. If the collected liquid is found to be contaminated, it will be treated and disposed of by certified disposal contractors.

10.1.3.2.5 Storm Sewer

The storm sewer system for the new facilities will consist of a system of stormwater ditches and culverts. Runoff will be collected by these components and routed to a new onsite stormwater detention basin. Overflow from the detention basin will discharge to the Palomar Ditch which discharges to San Diego Bay. The minimum cover requirement, loading, and material selection for culverts will be adequate for HS20 truck loading except where design for heavier loads is required.

The proposed development with the detention basin will maintain or reduce pre-development peak runoff rates.

Erosion and sedimentation will be controlled so as to retain sediment onsite and prevent violations of water quality standards.

Permanent erosion and sedimentation control measures for the plant site will include the runoff collection system as well as surfaced traffic and work areas. Final grading and surfacing within the limits of the new facilities will include asphalt paving and aggregate surfacing. These measures will minimize the possibility of site erosion and resulting off-site sedimentation.

Temporary erosion and sediment control measures, which comply with the state and local requirements, will be provided during the construction phase.

10.1.3.2.6 Sanitary Waste

Sanitary waste will be conveyed to an existing sanitary sewer that currently runs north-south along the east of the site. This is the City of Chula Vista sewer pipeline interconnected to the City of San Diego Metropolitan Wastewater Treatment System.

10.1.3.2.7 Spill Protection

Spill containment measures will be provided for chemical storage and chemical additive/lube oil skid areas. The containment structure for the aqueous ammonia storage tank will be sized for 125 percent of the tank capacity. All other chemical storage tanks will be provided with a containment structure having a volume equal to at least 110 percent of the capacity of the largest tank in a common containment area. Capacity will also allow for fire protection which consists of 500 gpm for a total or 10 minutes. In addition, outdoor containment structures will have a volume equal to at least the capacity of the tank plus the volume of rainfall from a 25-year, 24-hour storm event. Concrete curbs will be provided at

chemical additive/lube oil skid areas. Where required for protection of containment structure, appropriate surface coatings will be applied.

10.1.3.2.8 Roads

Access to the plant site will be from adjacent public streets via one or more paved driveways. The main access road to the power block area and administration building will be by the existing asphalt paved entrance road off Bay Boulevard. All additional parking areas and access drives will also be asphalt paved. Due to the flat terrain of the plant site, profile gradients for all roads will be minimal.

10.1.3.2.9 Fencing and Security

The existing site perimeter is currently enclosed by chain-link fencing. Chain link security fencing will surround the SBRP and the proposed substation and other areas requiring controlled access. A new controlled access gate located at the site entrance off Bay Boulevard will be used to control traffic to the site.

10.1.3.2.10 Geotechnical Investigation

The Geotechnical Engineering Investigation for the project is included in Appendix 10.6.